Joint Munitions Command

ENVIRONMENT, ENERGY SECURITY & SUSTAINABILITY (E2S2)

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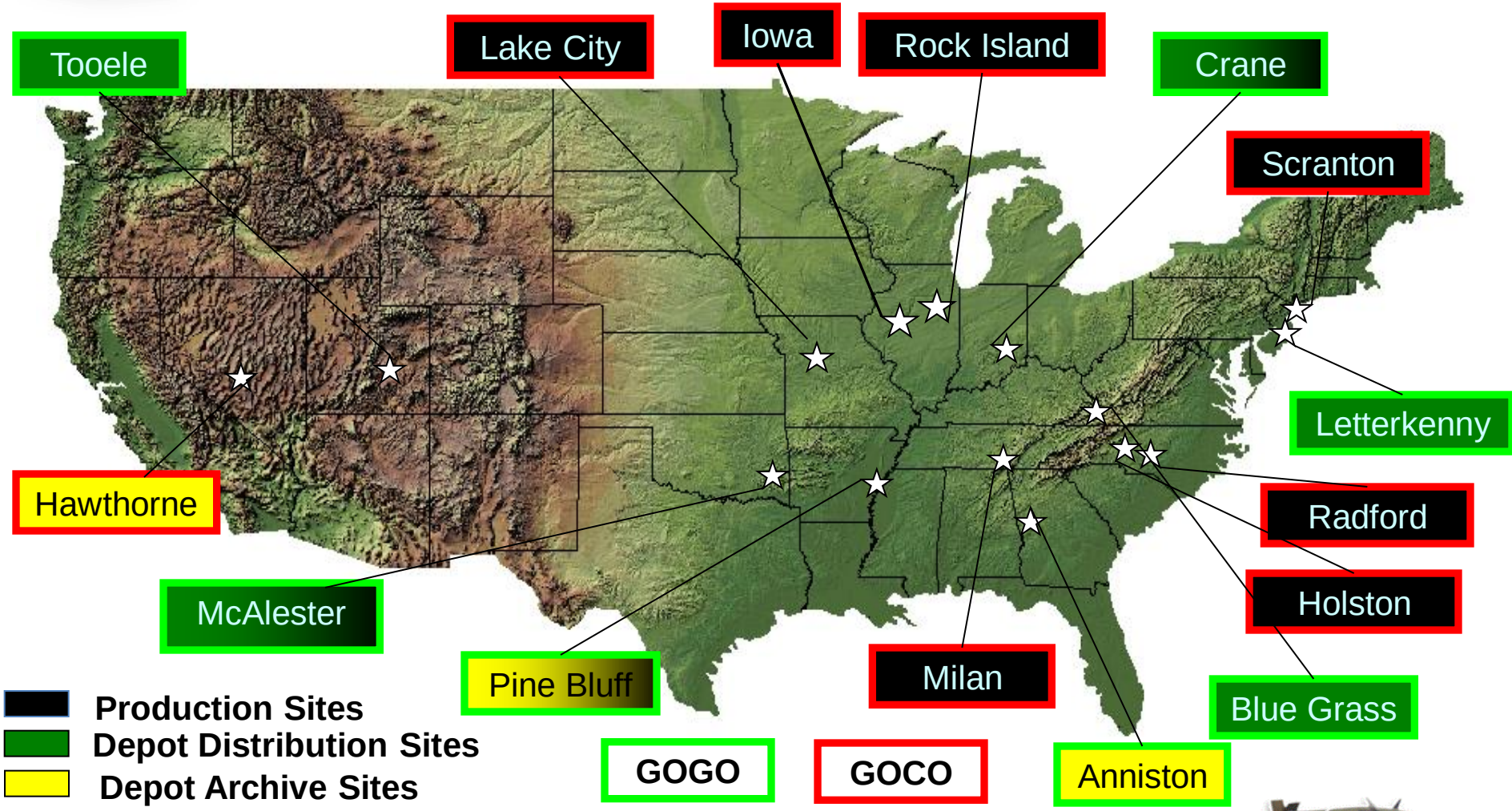
10009 - Improve Environmental Management Systems by Auditing with Lean Six Sigma

U.S. Army Joint Munitions Command (JMC)
AMSJM-ISM
1 Rock Island Arsenal
Rock Island, IL 61299

Organic Ammunition Industrial Base (Government-owned) (Post-BRAC)



Lean Six Sigma EMS Auditing Improvement Project Summary

- **Focus of project**
  - Improve Quality of EMS Audit by...
    -- Including environmental regulatory identification w/
    -- ISO 14001 nonconformance citation
- **Project Scope**: All JMC installations
- ***Where are we feeling the pain?***
  - Under-reported total environmental liabilities causing...
    -- Notice of Violation (NOV) Potential
- Management audit observations categorizing...
  - Improved liability prioritization

Problem/ Goal Statement

Problem: JMC Environmental Management System (EMS) ISO 14001 management conformance audit observations do not always include environmental regulatory standards that would have improved relational connection to potential Notices of Violation.

Goals:

Metric #1: Fifty percent (50%) of audit observations must cite environmental regulatory standard , “best management practice” or cite as a safety/IH/P2

Metric # 2: Increase Sigma Quality Level (SQL) significantly

Improve Phase Summary

Solution Selection

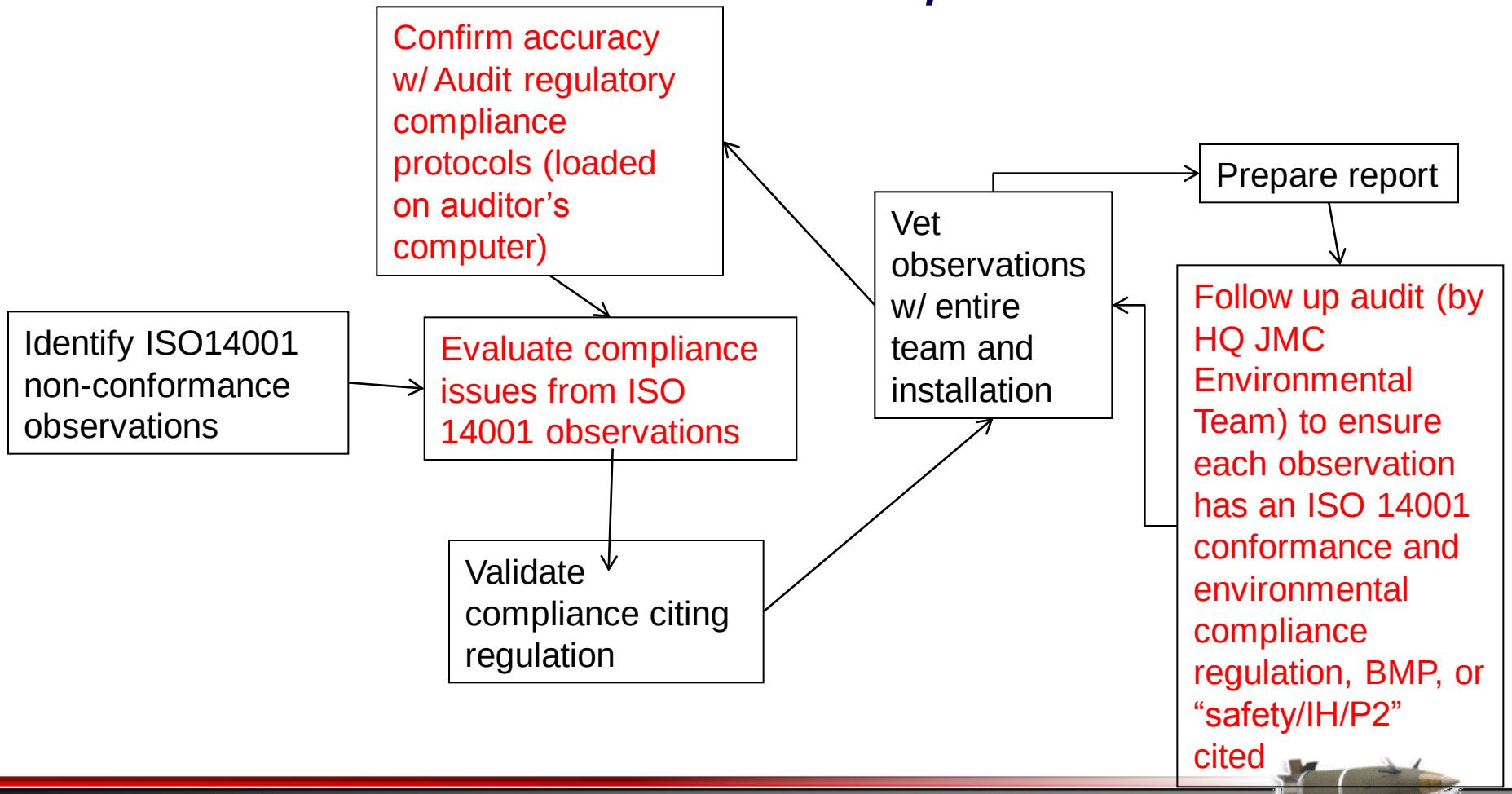
Using Nominal Group Technique

We determined the following solutions (three voted best cited in red):

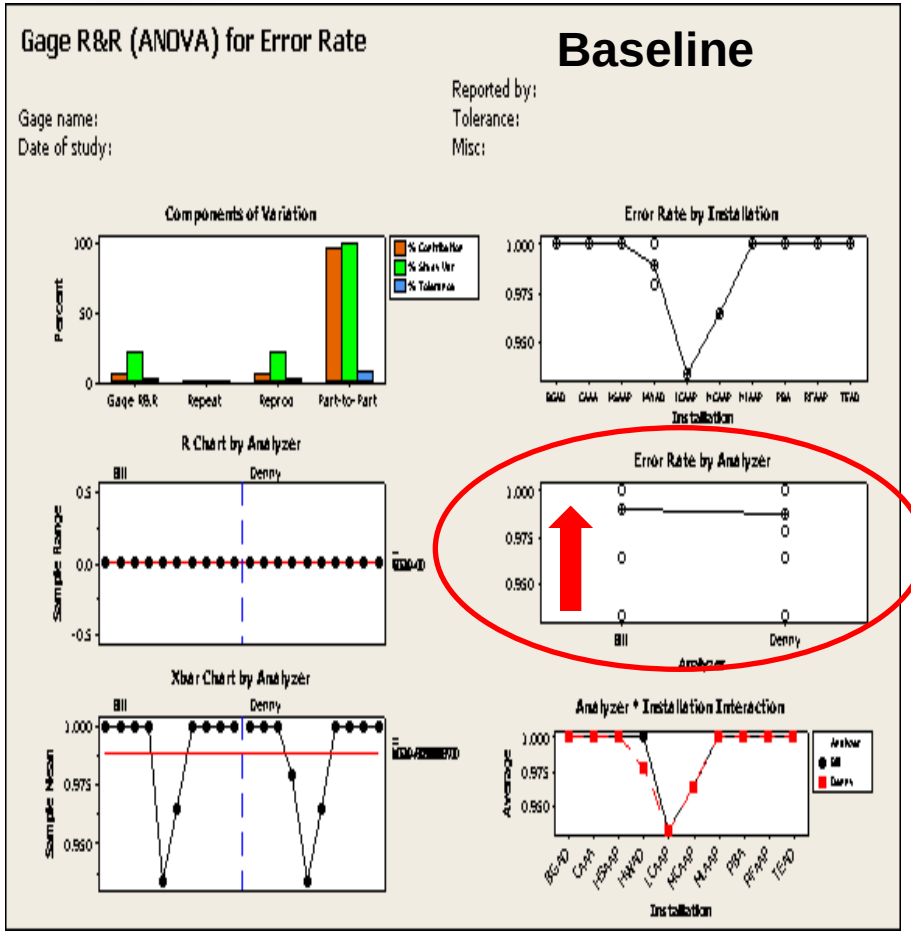
1. **Audit findings w/ compliance regulation cited (best)**
2. **Improve SOW**
3. **Audit follow-up**
4. **Provide adequate auditor training**
5. **Improve communication**
6. **Provide compliance protocols on computers**
7. **Provide additional compliance personnel**
8. **Ensure compliance auditor certification**

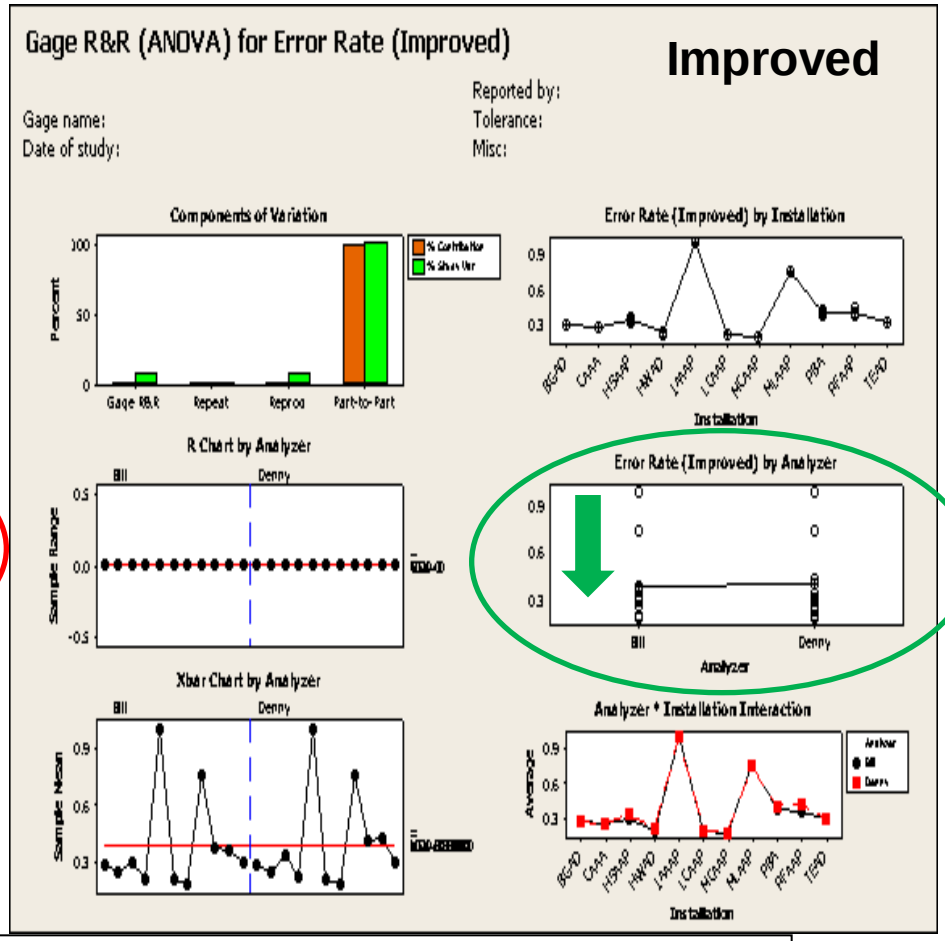
Improve Phase Summary (cont.)

"To-Be" Process Map



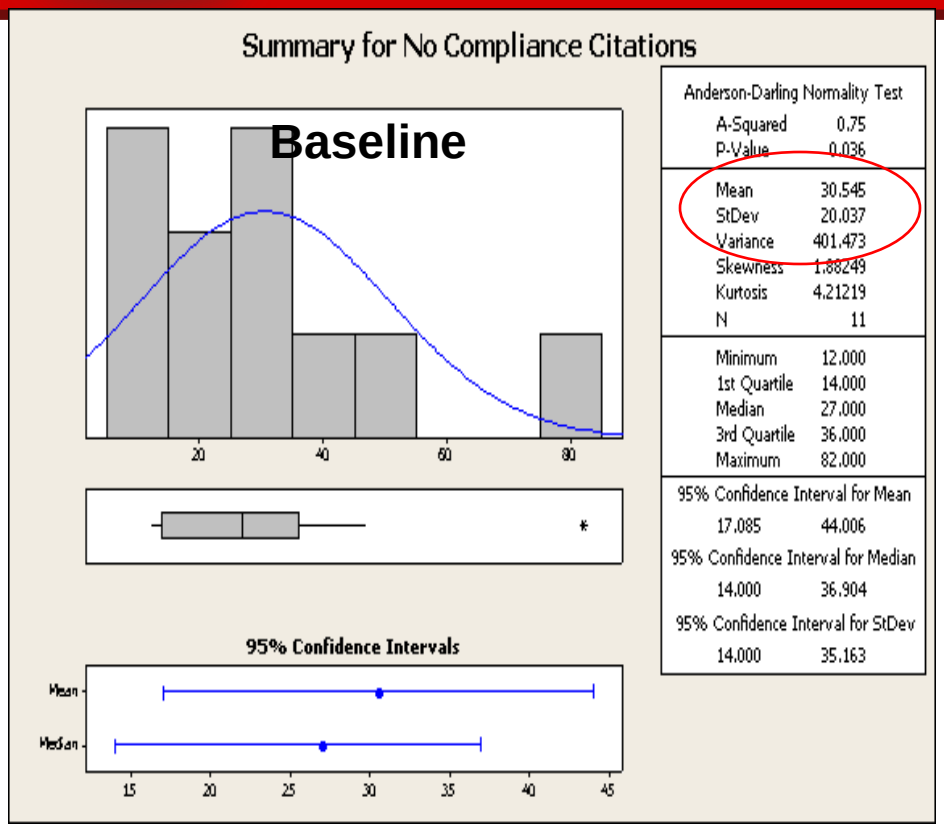
MSA Control Charts
Baseline vs. Improved

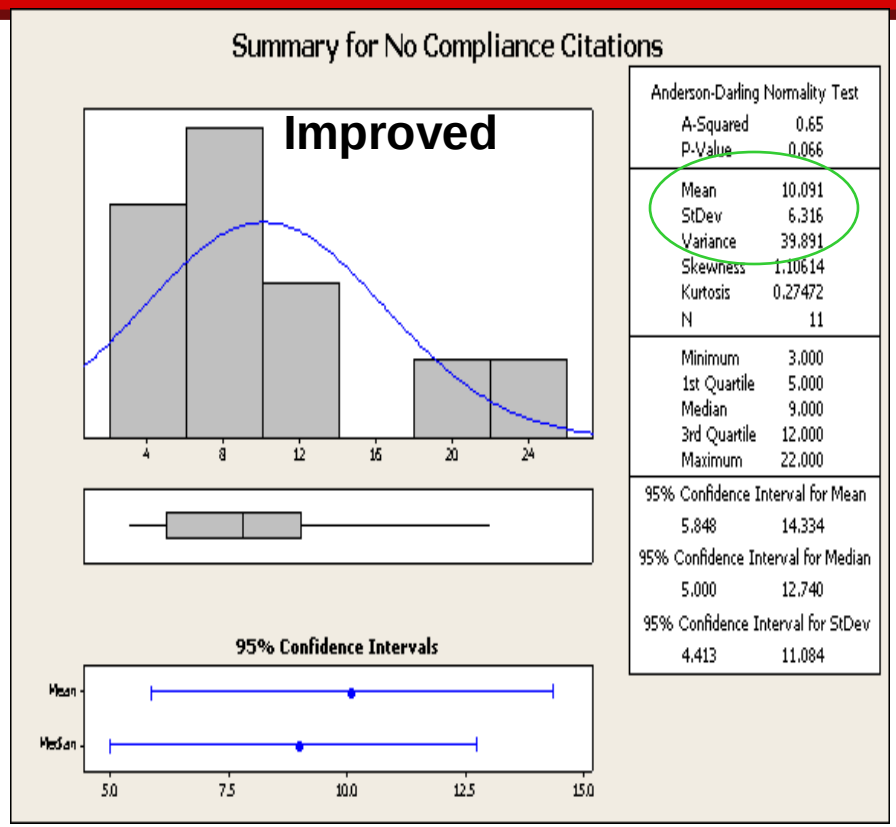




- Visual reduction in both average and variation

Summary Statistics
Baseline vs. Improved





The Lean Six Sigma challenge is to shift the mean and/ or reduce variation. Our baseline mean (30.5) and standard deviation (20.0) shifted to mean 10.1 and standard deviation 6.3 with variance from 401.5 to 39.9 showing improvement.

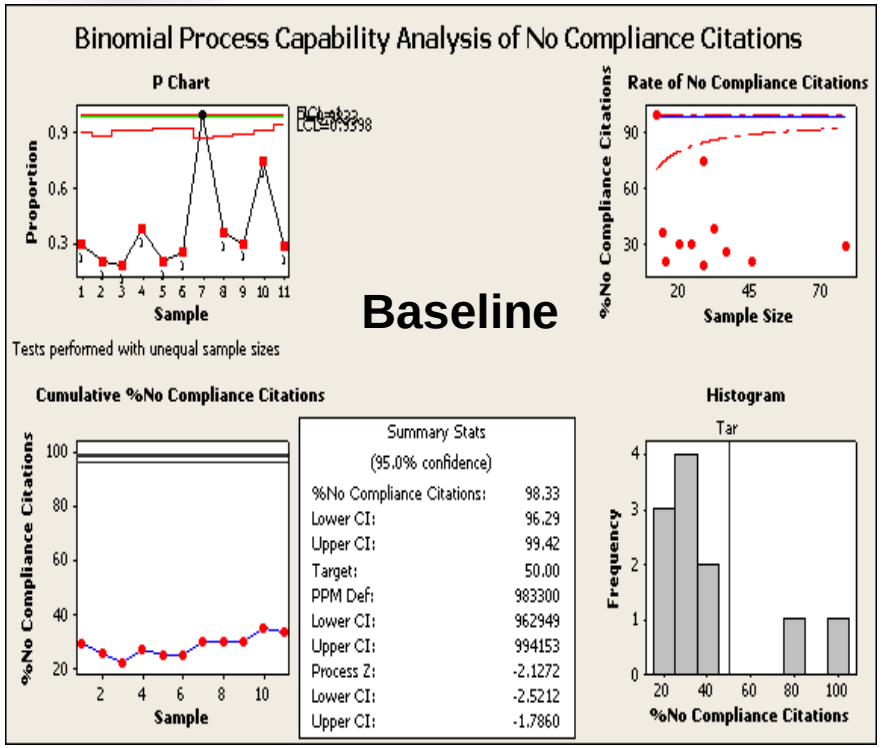
Summary Statistics Baseline vs. Improved

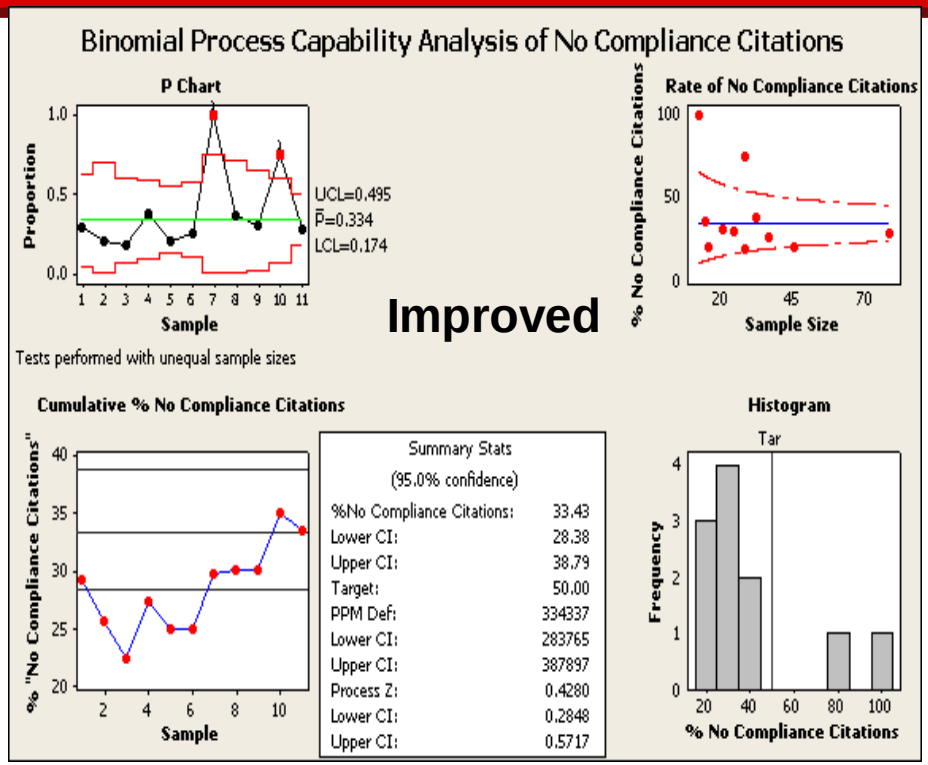
Installation	Reg Stated	Attempts	Defects	Good
HSAAP	0	24	24	0
LCAAP	1	15	14	1
MCAAP	1	28	27	1
PBA	0	32	32	0
HWAD	0	47	47	0
CAAA	0	36	36	0
IAAAP	0	12	12	0
RFAAP	0	14	14	0
TEAD	0	20	20	0
MLAAP	0	28	28	0
BGAD	0	82	82	0
Totals	2	338	336	2

Installation	Reg Stated	Safety	P2	IH	BMP	Strict EMS	Attempts	Defects (EMS only)	Good	
HSAAP	3	4	2	0	8	7	24	7	17	
LCAAP	4	7	0	0	1	3	15	3	12	
MCAAP	12	5	1	0	5	5	28	5	23	
PBA	7	13	0	0	0	12	32	12	20	
HWAD	16	7	1	0	12	9	45	9	36	
CAAA	14	7	1	0	5	9	36	9	27	
IAAAP	0	0	0	0	0	12	12	12	0	
RFAAP	5	2	0	0	2	5	14	5	9	
TEAD	2	6	0	0	6	6	20	6	14	
MLAAP	6	0	0	0	1	21	28	21	7	
BGAD	20	23	4	0	9	22	78	22	56	
Totals	89	74	9	0	49	111	332	111	221	

The Sigma Quality Level (SQL) for our baseline was 336/338 x 1,000,000 = 994,083 DPMO, SQL < 0.1. The SQL after process improvements was 111/332 x 1,000,000 = 334,337 DPMO, SQL > 1.9; showing improvement.

Process Capability Baseline vs. Improved





Met customer goal for < 50% no compliance citations (actual ~33% no compliance citations) through improvements to observations. Two-thirds (2/3) of audit observations now classified and validated to environmental compliance standards, identified as safety/ industrial hygiene, pollution prevention, or BMPs.

Business Impact

Type III: **More frequent up-to-date information on environmental compliance requirements providing:**

- **Better awareness,**
- **Funding visibility and prioritization, and**
- **Fix environmental problems prior to regulatory detection as an NOV.**
- **The SQL for the process was increased from < 0.1 to > 1.9 SQL.**

Lessons Learned

1. Difficult to pinpoint only one applicable regulation for an audit observation.
2. Safety and industrial hygiene observations should mention the appropriate regulatory exception
3. The ISO 14001 areas of legal requirements, operational control, and document control have the highest frequency regulatory noncompliance.
4. Always more appropriate to follow a regulatory compliance audit with an ISO 14001 audit, so the efficiency and effectiveness of an installation's Environmental Management System can be properly evaluated.
5. Always some "defectives" (no compliance citations) during an ISO 14001 audit since some ISO 14001 non-conformances under the ISO 14001 standard have no regulatory compliance parallel or standard.
6. Auditing environmental professionals must be well versed in both the ISO 14001 standard and environmental regulatory standards and have experience and education in performing environmental auditing.